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ABSTRACT

This research examined the impact of state policies regarding tuition rates and financial aid budgets on access to public higher education. The study addressed two specific issues: (1) whether undergraduate enrollment rates of students in different racial groups changed during the period 1976-94, and (2) the impact of increased tuition at public colleges and universities on students of different races. The study first analyzed trends in public higher education enrollment rates, and then applied a fixed-effects model utilizing cross-sectional and time-series data. The study's conclusions, consistent with those of earlier studies, included the following: (1) community college students seem to be more sensitive to changes in need-based state funding than are four-year students, but the impact of changing economic conditions varies depending on the type of institution and (2) in four-year institutions, enrollment appears to be inversely related to unemployment rates, with the opposite being true in community colleges. Enrollment trend data are summarized in text and 11 figures; additional tables and figures synthesize some of the model data. An appendix provides a list of Census Bureau regions. (Contains 48 references.) (CH)

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Rising Public Tuition Prices and Enrollment in Community Colleges and Four-Year Institutions

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1. Introduction

Policy makers have long been concerned that the cost of higher education may create a barrier to entry for students wanting to attend college. In promoting the first national student aid legislation, the G.I. Bill of Rights, President Roosevelt in 1943 said that

> Lack of money should not prevent any veteran of this war from equipping himself for the most useful employment for which his aptitudes and willingness qualify him. I believe this nation is morally obligated to provide this training and education. (quoted in Goodwin, 1994, p. 469)

Four years later, President Truman's Commission on Higher Education sounded an alarm concerning equality of access for *all* to the nation's colleges and universities:

> By allowing the opportunity for higher education to depend so largely on the individual's economic status, we are not only denying to millions of young people the chance in life to which they are entitled; we are also depriving the nation of a vast amount of potential leadership and potential social competence which it sorely needs. (quoted in Mumper, 1996, p. xv)

The federal government did not become a major player in helping to ensure equal opportunity for postsecondary education until the passage of the Higher Education Act of 1972, which implemented the Basic Educational Opportunity Grant program (later renamed Pell Grants). Unlike the federal government, however, the states have long played a role through direct subsidy of public colleges and universities, dating back to the Morrill Act in 1862 and the founding of many of this country's great land-grant universities. These subsidies historically have kept public tuition rates relatively low for all students.

The impact of state policy on enrollment in public higher education is critical. Clotfelter (1991) notes that

> It would be impossible to gain a fair impression of U.S. public policy to encourage college attendance without considering the role of the states. State policies directly affect the demand for undergraduate places in two ways — through their institutional support of public institutions and through state student aid programs. (p. 113)

The level of institutional support of public institutions helps to determine the tuition paid by students; the higher the support provided by the state, the lower generally is the tuition paid

by all students. State student aid programs award financial aid (the greatest portion based on need) to individual students which can be used at a public college or university within the state, and in some instances, private colleges and out-of-state institutions.

The last two decades have been a turbulent period for college tuition prices. Table 1 presents the annual real increase in tuition and fee charges at public and private institutions, as well as the annual change in median family incomes for three different periods over the last two decades. In the latter half of the 1970s, tuition prices at both public and private institutions fell in real terms, as tuition increases did not keep pace with the double-digit inflation of this period.[1] In the 1980s, real tuition rose in both sectors, but at a faster rate in private colleges. While the 1990s have seen a slowing of the rate of growth of private college tuitions, the rate at public colleges has increased.[2] This has occurred at a time when incomes in the country have stagnated, and the income gap between rich and poor families has widened.[3]

Table 1: Annual Changes in Undergraduate Tuition Prices at Colleges and Universities, and Changes in Incomes

	Public College Tuition		Private College Tuition		
Period	4-Year	2-Year	4-Year	2-Year	Median 4-Person Family Incomes
1976 - 1980	-3.1%	-1.6%	-0.8%	0.7%	-1.2%
1980 - 1990	4.3%	3.2%	5.0%	4.1%	1.0%
1990 - 1994	6.1%	6.6%	3.1%	2.3%	0.4%
1976 - 1994	3.0%	2.8%	3.2%	2.9%	0.2%

Note: All changes in constant (1994) dollars. Public tuition is for resident students, and includes all mandatory fees (excluding room and board).

Source: Author's calculations from National Center for Education Statistics (1995), Table 306, and U.S. Bureau of the Census (1996f).

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1 Private 2-year tuition prices did increase slightly during this period, but this sector represented less than 2% of all undergraduate students in the country.

2 See Kane (1994) and Hearn, Griswold, and Marine (1996) for some explanations of the reasons for the large public college tuition increases in the 1990s. The consensus opinion is that the increase has been driven by the slowdown in state funding for public higher education.

3 Many authors have written about the rise in income inequality in the country and the possible causes during the 1980s. See for example Levy (1988), Levy and Murnane (1992), and Bradbury (1996) for econometric analyses, and Cassidy (1995) and Phillips (1990) for more general descriptive analyses.

Most studies that have examined students' demand for higher education have reached the same basic conclusion: tuition prices (either the "sticker price" or net of financial aid) are inversely related to the probability of enrolling in college, *ceteris paribus*. As tuition rates increase we would expect fewer students to enroll in college. Economists describe this relationship between tuition prices and enrollment by stating that students face a downward-sloping demand curve.

In contrast to the economic evidence in the literature however, undergraduate enrollments rose through the 1980s, even in the face of these large tuition increases. In 1976, 48.8% of all high school students continued on to attend a college or university within 12 months of graduation, and this number rose only slightly to 49.3% by 1980 (National Center for Education Statistics, 1995, Table 177). In 1991 this number climbed to a peak of 62.4%, but then leveled off and actually declined slightly since then. These numbers differ across racial groups, however, with White students making larger gains in their enrollment rates than did Black or Hispanic students.

In 1994, 81% of all undergraduate students were enrolled in public institutions. Given the magnitude of the public college and university tuition increases in the 1990s, a relevant policy concern is whether future students will be able to enroll in public higher education at the rates achieved in the late 1980s and early 1990s. While the retention of students in college and their eventual graduation are also important issues, the first step is to ensure that students have an opportunity to enroll in college in the first place.[4]

As public tuition prices increase, they raise the important policy question of whether rising prices will place a damper on college enrollment rates. Will the patterns of the 1980s continue, with enrollments increasing even in the face of rising prices? Or will these rising prices finally take their toll on students' (and families' ability to pay for college? A related question is whether these increasing tuition prices have varying impacts on students of different characteristics, such as race, or in different college sectors. As described earlier, while college-going rates as a whole increased in the 1980s, the increase for White students outpaced that of Blacks and Hispanics.

The specific research questions I address in this paper are:

1. How have the public undergraduate enrollment rates of students in different racial groups changed during the period from 1976 to 1994?

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[4] For recent reports on the relationship between financial aid and student retention and graduation, see The Institute for Higher Education Policy (1995) and the General Accounting Office (1995).

2. As states increase public college and university tuitions, what is the impact on students of different races in 4-year institutions and community colleges?

Most other studies that have examined the relationship between price and access have focused on the individual as the unit of observation. Those studies are usually conducted using cross-sectional databases such as the National Longitudinal Survey of Youth or the High School and Beyond Survey. This analysis focuses on states as the unit of observation, and how state policies regarding the setting of tuition rates and financial aid budgets affect access to public higher education.

2. Findings From Previous Research

Researchers have long studied the effect of tuition on enrollment in higher education. These studies have sought not just to confirm the existence of a downward-sloping demand curve for higher education, but to provide more information regarding the nature of that curve. Is the relationship between tuition and enrollment linear or curvilinear? How sensitive is enrollment to tuition at different price levels? Do students with different characteristics have different demand curves?

When examining the relationship between tuition and enrollment in higher education, it is problematic to exclude the existence of financial aid in the equation. Financial aid acts as a price discount, serving to lower the net cost paid by the student. Nevertheless, there is some evidence to indicate that students react differently to the posted tuition level, often referred to as the "sticker price," than they do to the actual price they pay after taking financial aid into account.[5]

Most multivariate analyses that examine the relationship between tuition and enrollment, generally referred to as student demand studies, fall into two categories: 1) cross-sectional studies, or 2) time-series studies. Cross-sectional studies examine how individual students behave in the face of various postsecondary options. Researchers use multivariate analysis on datasets such as the High School and Beyond survey to measure the impact of tuition and aid on individual students' decisions to attend college or not. These analyses measure how much of the college-going decision is based on price, as compared to other factors.

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5 Most researchers exclude the cost of room and board in the calculation of the sticker price, as they assume that these subsistence costs would be borne by the student even if she chose options other than attending college.

An alternate methodology is time-series analysis. Time-series studies examine changes over time in aggregate enrollments of students (e.g., in the entire U.S. or in individual states or institutions). These studies relate changes in aggregate enrollments to tuition changes during the given period.

Each approach has advantages and limitations. While cross-sectional studies often have large sample sizes, and therefore much statistical power to examine subsets of data (e.g., racial or income categories), they commonly measure tuition sensitivity at only a single point. They thus do not provide a measure of how tuition sensitivity changes over time. In addition, they generally only measure the tuition sensitivity of first-time enrollees, not total undergraduate enrollments. Time series analyses examine behavior over multiple periods and thus have the ability of measuring how enrollments change in response to tuition changes in multiple years, but often are unable to track changes in the choices of individual students or groups of students.

A 1988 book by Larry Leslie and Paul Brinkman often is referred to as the classic analysis of student demand studies. They reviewed 25 studies published between 1967 and 1982, including both cross-sectional (five) and time-series (20) analyses. The studies examined different types of institutions, public and private, 2-year and 4-year. The authors calculated an overall student price response coefficient (SPRC), a measure of students' sensitivity to tuition increases. They found that

> The results of all studies were in the expected direction; that is, enrollments declined when prices increased...The average SPRC for the 25 studies was about -0.7; that is, for every $100 increase in tuition price, one would expect...a drop of 0.7 percentage points in the first-time enrollment rate.[6] (p. 125)

The SPRCs the authors calculated from the 25 studies ranged from -0.2 to -2.4.[7] It is important to note that this SPRC range applies to first-time enrollees only.

Leslie and Brinkman's meta-analysis was an important contribution to the literature. It confirmed the findings of earlier meta-analyses performed by Jackson and Weathersby (1975) and McPherson (1978). Jackson and Weathersby examined seven studies and found SPRCs from -0.05 to -1.46. McPherson examined ten studies and found SPRCs from -0.05 to -1.53. Both of

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6 In this and other studies, measures of tuition sensitivity are represented for the "mean" student, i.e., all other characteristics are held to their means.

7 Two studies had positive SPRCs. One of these utilized only descriptive statistics, and the other examined only applicants to community colleges in New York in a single year.

these ranges are similar to that of Leslie and Brinkman when one takes into account that the SPRCs in the two earlier studies were normalized to 1974 dollars.[8]

Many studies have been published since these three meta-analyses were conducted. Some help fill the methodological gaps left by the earlier studies; many address later cohorts of students. Almost all of these studies are consistent in one respect: each found an inverse relationship between tuition and the probability of enrollment in higher education. The exact size of the effect may differ depending upon the methodology used, the dataset analyzed, and the type of students or institutions examined. But the magnitude of the effect is remarkably consistent across most of these studies. The evidence indicates that a tuition increase of $100 is consistent with a drop in enrollment of first-time students between 0.50 and 1.00 percentage points. It is important to note that these changes assume all other variables that affect enrollment demand are held constant.

Another consistent finding among many of these studies is that there is a relationship between race, income, and sensitivity to tuition and financial aid. While the magnitude of the effect differs across studies, most researchers find that poorer students are more sensitive to increases in net cost, whether those increases take the effect of tuition increases or financial aid decreases. Tuition increases that are not offset by concomitant increases in financial aid appear to have the effect of reducing access to higher education for our country's poorest students. In addition, there is a good deal of evidence that Black students are more sensitive to college costs than White students, even controlling for income, socioeconomic status, and ability. For Hispanic students, the evidence is more mixed. While some authors found that Hispanic students tended to react to tuition and aid changes in a fashion similar to that of Black students, others found a different response. Very few quantitative analyses have examined demand for higher education by other racial groups.

One serious obstacle to using the findings of these earlier studies to inform current policy is that the studies were conducted when tuition levels were significantly lower than today.[9] Thus, if the tuition demand for higher education is curvilinear, SPRCs today may be larger than what the authors found, indicating that students are more sensitive to tuition increases given prices in recent years. In addition, many of the studies examined enrollments in only one or two states, or even a single institution, thus limiting the ability to compare policies across states and their effect on access to public higher education.

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8 See Leslie and Brinkman (pp. 129-131) for a discussion of some of the problems with the Jackson and Weathersby analysis, and its applicability to their own work.

9 1976 was the latest year for which data were analyzed in the studies reviewed by Leslie and Brinkman. Most of the later studies used data from the mid-1980s or earlier.

Even given this caveat, however, it is clear there is an inverse relationship between tuition and enrollment. Both the cross-sectional and time-series evidence is consistent on this issue.

Many of these same studies examined the relationship between student financial aid and enrollment in colleges and universities. One issue that complicates the analysis of this relationship is that "financial aid" is not a singular entity, but is a term that incorporates many different forms of student financial assistance. This includes grants, subsidized loans, unsubsidized (market rate) loans, tuition remission, and work study wages. The net cost paid by the recipient of a $1,000 grant is different than that of a student receiving a $1,000 subsidized loan. Economists would argue that these two could be compared simply by calculating the subsidy value of the loan, and comparing this to the grant. Yet in practice, it appears that students are not always rational economic actors, and they react differently to various forms of financial aid and tuition changes, even if the economic value of each is the same.

There is also evidence that students react to the "sticker price" of the college, either because they are not aware of the existence of financial aid or do not believe they would qualify for it.[10] In a recently issued book, Mumper (1996) summarizes the dilemma facing policy makers who seek to use financial aid to lower the cost of higher education for needy students:

> A plan which may look good in an economics class may prove counter-productive in the real world of college finance. In this view, lower-income students are likely to become discouraged by rapid increases in the "sticker price" of higher education. This occurs because information about tuition levels is much more widely known and available than is information about financial aid programs. (p. 45)

The evidence for this view can be seen in many of the studies described in Heller (1996). Those studies that analyze the relationship between enrollment and tuition changes compared to financial aid awards generally find different-sized effects for each. Similarly, those studies that include different types of aid as explanatory variables (i.e., grants versus loans) find different effects for each type.

The evidence regarding the relationship between financial aid and access to higher education is more complex than the findings on tuition. While difficult to generalize, those researchers who conducted cross-sectional analyses of the major longitudinal datasets (NLS72, NLSY, and HSB) found that students were sensitive to aid awards when they made the decision to enroll in college. The level of that sensitivity varied from study to study, depending

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10 For an excellent review of the literature on this topic, see O'Brien (1992).

upon the type of aid (grants, loans, or work study) and dollar value of the aid. The effect that aid has on enrollments is difficult to compare with that of tuition; while some of these studies found similar effects between the two (i.e., a $100 increase in aid would have roughly the same effect on enrollments as a $100 decrease in tuition), others found students to be less sensitive to aid than tuition.

The evidence from time-series studies is more mixed, however. Some researchers concluded that grants had no significant effect on access. Others came to different conclusions, based on different interpretations of the data.

All other things being equal, one would expect students at community colleges to be more sensitive to tuition and aid than students at 4-year colleges. This is because lower-income students are over-represented in community colleges, and as discussed earlier in this section, lower-income students are more sensitive to price increases.[11] Minority students also are over-represented in community colleges.[12]

In their review of student demand studies, Leslie and Brinkman (1987 and 1988) examined a handful of studies that analyzed enrollments separately at public 4-year and community colleges. While they estimated the overall student price response coefficient (SPRC) to be -0.7, they estimated the 4-year public SPRC to be -0.6 to -0.7, and the community college SPRC to be -0.9. They concluded that community college students were more responsive to tuition than students at 4-year colleges. Few studies have been published since the Leslie and Brinkman review that have examined enrollments at 4-year institutions and community colleges individually.[13]

3. Methodology and Data Sources

The first part of this study provides an analysis of public higher education enrollment rates in the United States during the period from 1976 to 1994. Since the 1960s, the National Center for Education Statistics (NCES) of the Department of Education has collected enrollment data from all colleges and universities in the U.S., and since 1976, has collected

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11 See McPherson and Schapiro (1994) and Frances and Morning (1993) for data on the income distribution of students by sector.

12 See National Center for Education Statistics (1995) for data on sectoral enrollments by race.

13 Two studies that have examined these groups separately include Kane (1995) and Rouse (1994). Both confirm the earlier finding of a higher level of tuition sensitivity among community college students.

data on enrollments by race.[14] These data provide an annual census of enrollments in this country's non-profit postsecondary institutions. The analysis here is limited only to accredited, degree-granting public institutions under the control of one of the fifty states.

The enrollment data were collected by NCES on the HEGIS and IPEDS survey forms. The IPEDS and HEGIS data used in this analysis are from the CASPAR database, distributed by Quantum Research Corporation (1995).[15]

In calculating enrollment rates, one must make an assumption regarding the population group on which to base the rate. Traditionally, researchers have used the 18-24 age group as the denominator of the ratio between enrollments and population. While some recent studies have documented the aging of the college-going population, in this study I have chosen to restrict the analysis to the 18-24 age group in each state as the denominator, while acknowledging that the numerator includes students from all age groups.[16] These numbers should more accurately be called "enrollment ratios," rather than "enrollment rates," but for simplicity of language I will retain the traditional wording of "enrollment rates." The population data used in calculating the enrollment rates comes from Census Bureau data from the 1980 and 1990 Censuses, as well as inter-censile estimates for the non-census years (U.S. Bureau of the Census 1996a, 1996b, 1996c, 1996d, and 1996e).

The second half of this study estimates a fixed-effects model utilizing cross-sectional and time-series data. The general form of the model is:

$$r_{ijt} = \beta_0 + \beta_1 p_{jt} + \beta_2 a_{jt} + \beta_3 c_{jt} + \delta_j + \phi_{dt} + \varepsilon_{ijt}$$

where

r_{ijt} = Enrollment rate of race i in state j in year t (total enrolled divided by 18-24 population)

p_{jt} = Vector of tuition prices in state j in year t

a_{jt} = State financial aid expenditures in state j in year t

c_{jt} = Vector of economic controls in state j in year t

δ_j = State fixed effects

ϕ_{dt} = Year effects, which are allowed to vary by Census division d

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14 Racial data were collected in even years beginning in 1976 and every year since 1990.

15 All references to IPEDS data are from the CASPAR database.

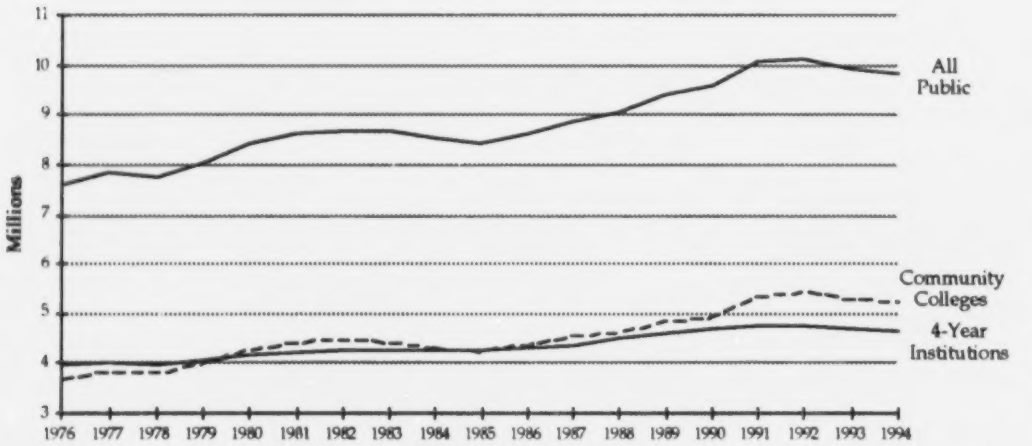
16 See Koretz (1990) for an analysis of the different methodologies for calculating enrollment rates.

This model, combining cross-sectional and time-series analysis, takes advantage of the natural variations in the outcome and predictor measures both across states and over the time period involved. The data in the model are weighted by the square root of the 18-24 population in the 1990 Census for each state.

Data on tuition prices is from the Washington State Higher Education Coordinating Board (1996), which conducts an annual survey of public college and university tuition rates in each state. Data on state need-based financial aid budgets comes from the National Association of State Scholarship and Grant Programs (1994), which similarly conducts an annual survey. Data on unemployment rates (for all people age 16 and older, and for Whites, Blacks, and Hispanics 16 and older) is from the U.S. Bureau of Labor Statistics (1996).

4. Trends in Public Higher Education Enrollment Rates, 1976 to 1994

Figure 1 shows the total headcount enrollments in public 4-year institutions and community colleges from 1976 to 1994.[17] Enrollments peaked at just over 10 million in the early 1990s, with the largest gains occurring in the 1980s and early 1990s. Most of this growth came in



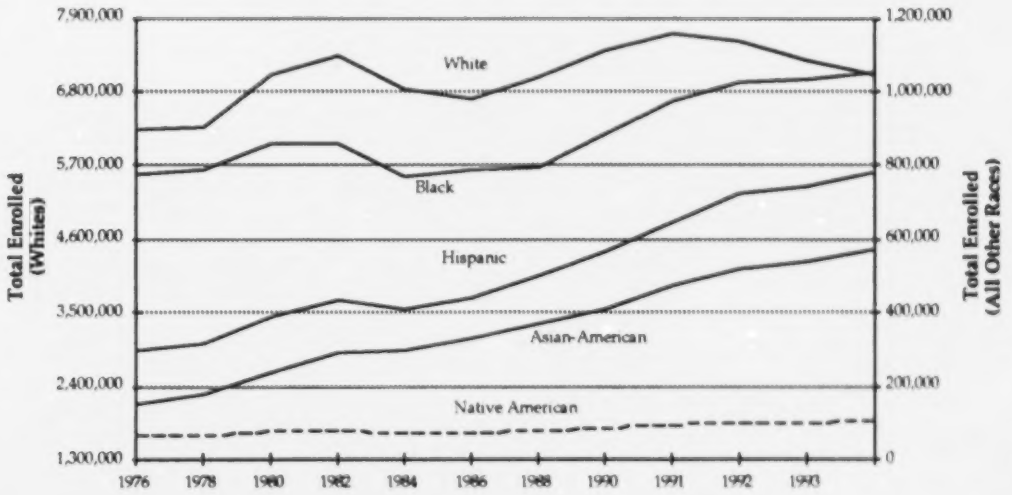
Source: Author's calculations from IPEDS data.

Figure 1: U.S. Public Undergraduate Enrollments by Sector

[17] All enrollments referred to in this analysis are for undergraduates only. Graduate and professional students, and students enrolled exclusively in non-degree courses are excluded.

community colleges, which in 1976 trailed 4-year institutions in enrollment, but by 1994 surpassed them by over half a million students.

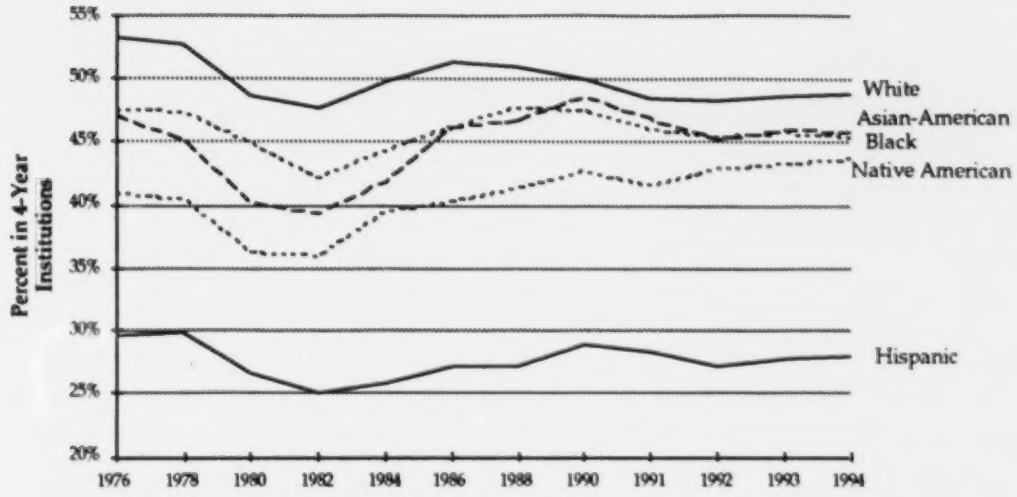
All racial groups contributed to this gain in enrollments. Figure 2 shows the enrollment of the five IPEDS racial groups, with the enrollment of White students on the left scale, and the other groups on the right scale. It can be seen that Asian-American and Hispanic students made the largest gains during this period, increasing their enrollments 284% and 166% respectively. Native American enrollments increased 62%, followed by Blacks at 37% and Whites at 14%.



Source: Author's calculations from IPEDS data.

Figure 2: U.S. Public Undergraduate Enrollments by Race

Each race enrolls in the community college and 4-year sectors at different rates. Figure 3 shows the percentage of all public college and university students enrolled in 4-year institutions for each of the five groups. The trend is consistent for four of the five groups — students were less likely to be attending a 4-year institution in 1994 than in 1976, with Hispanics lagging far behind the other groups. Native-Americans were the exception, having increased their relative enrollment in 4-year institutions during this period.



Source: Author's calculations from IPEDS data.

Figure 3: Percentage of Students Enrolled in 4-Year Institutions by Race

More illustrative of gains in college enrollment is an examination of enrollment rates. As described in the previous section, "enrollment rate" in this study refers to the number of students enrolled divided by the 18 to 24 year-old age group. Figure 4 shows the national enrollment rates in public colleges and universities (2-year and 4-year, part-time and full-time combined) for the five racial groups and for all groups combined. The enrollment rate of all students climbed from 26.8% in 1976 to a peak of 39.1% in 1992, with the rate staying within half a percentage point since then. This rate is heavily driven by the large number of White students, who had steady gains from a low of 27.5% in 1976 to a peak of 41.8% in 1992, with a slight decline since then. Asian-American students enrolled in public institutions at the highest rates during this period, ranging from a low of 46.5% in 1990 to a high of 60.4% in 1994. The enrollment rate of Native American students in recent years has exceeded that of White students, while the rates at which Black and Hispanic students enroll in college lag far behind that of the other groups, though they have made gains over the years.[18]

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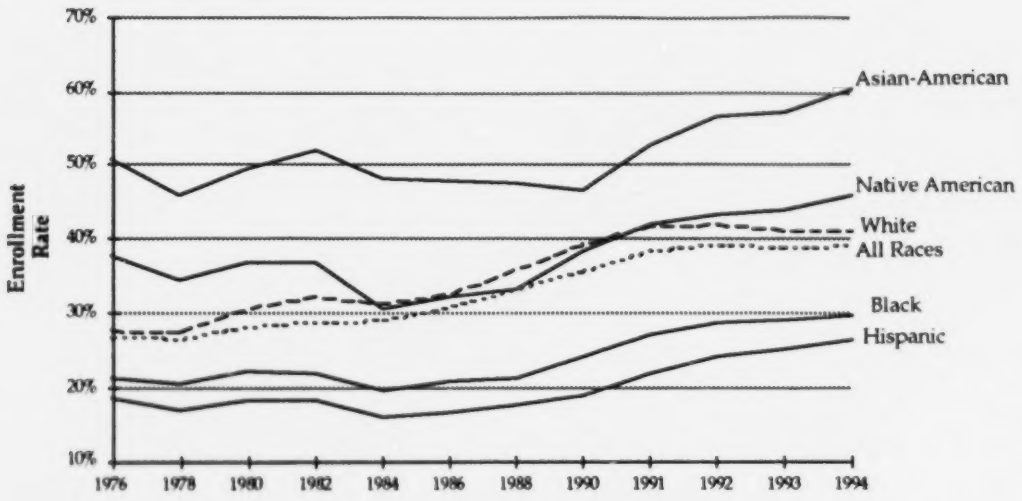
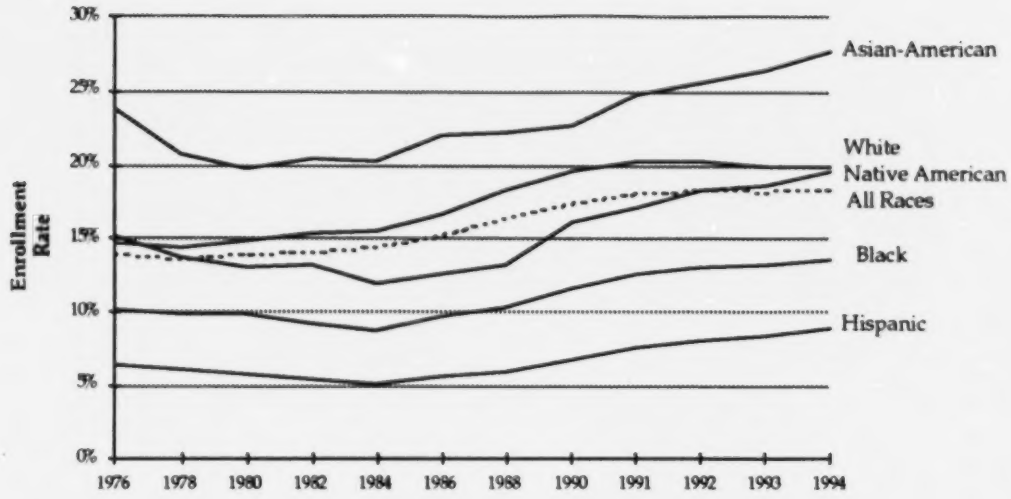
18 The enrollment rate calculations for Native Americans have a wider margin of error than the other groups because of their relatively smaller population.



Source: Author's calculations from IPEDS data and Census Bureau.

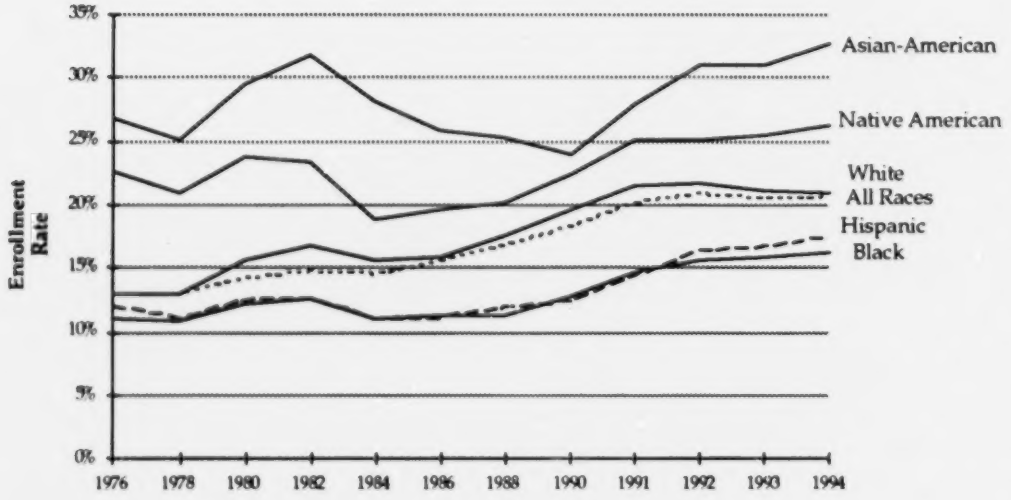
Figure 4: U.S. Public Undergraduate Enrollment Rates by Race

Figures 5 and 6 show the national enrollment rate of each racial group in public 4-year institutions and community colleges, respectively. In 4-year institutions, Asian-American and White students have the highest enrollment rates, though the rate at which Native American students enroll in these colleges has recently reached that of White students. The Black and Hispanic enrollment rates lag behind that of the other groups. In community colleges, Native American students enroll at higher rates than Whites, while the enrollment rates of Hispanics and Blacks are nearer those of the other groups than in the 4-year institutions. In addition, the enrollment rates of these two groups are much closer to each other in community colleges than in 4-year institutions, where Hispanics lag far behind Blacks.



Source: Author's calculations from IPEDS data and Census Bureau.

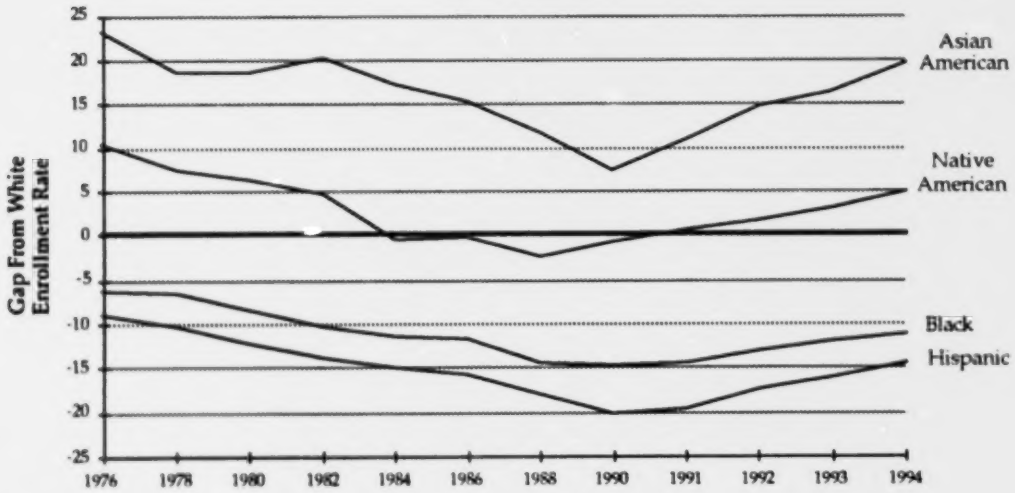
Figure 5: Public Undergraduate Enrollment Rates in 4-Year Institutions by Race



Source: Author's calculations from IPEDS data and Census Bureau.

Figure 6: Public Undergraduate Enrollment Rates in Community Colleges by Race

While Blacks and Hispanics have increased their rates over the last ten years, the gap between their enrollment and those of the other groups has widened. Figure 7 shows the difference between the enrollment rate of each minority group and the rate at which White students enrolled in college, for all public institutions (4-year and community colleges combined). A positive number indicates that the group enrolls at a rate higher than Whites; a negative number indicates the group enrolls at a lower rate. In 1976, the Black enrollment rate was 6.4 points below that of all students, and the Hispanic rate was 9.1 points lower. By 1994, this gap had grown to 11.1 and 14.5 points, respectively, though the trend in recent years is in the direction of closing the gap. The gains in raw enrollment numbers by Blacks and Hispanics shown in Figure 2 (the numerator of the enrollment rate calculation) have been at least partially offset by the larger growth in their 18-24 populations (the denominator).[19] While not shown here, the gap between Black and Hispanic enrollment rates, and that of Whites, grew during this period in both community colleges as well as 4-year institutions.



Source: Author's calculations from IPEDS data and Census Bureau.

Figure 7: Difference Between Public Minority Enrollment Rates and White Rate

One possibility for the ongoing gap between Black and Hispanic public enrollment rates and that of Whites is that these two groups may be shifting more to private institutions. Some

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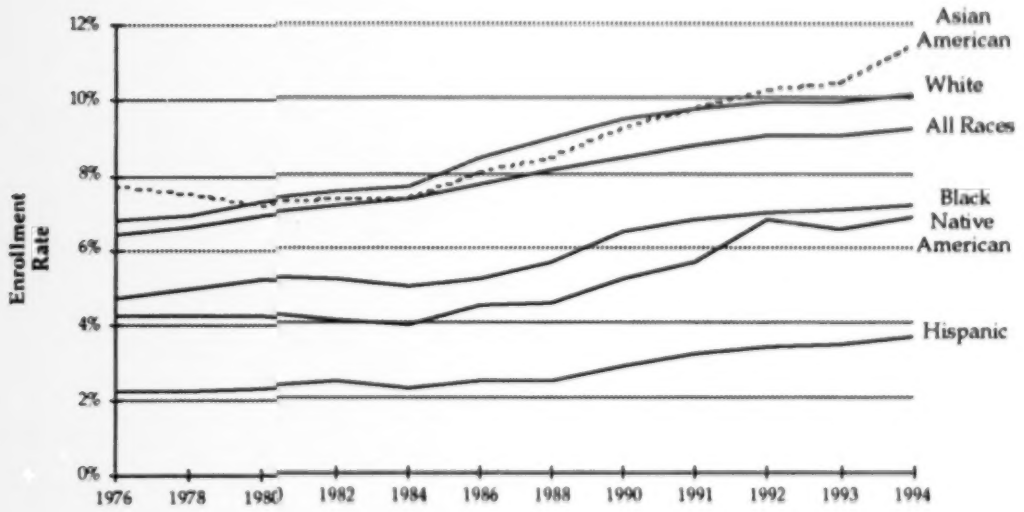
19 The Black 18-24 population actually declined slightly between 1976 and 1994, but much less than did the White population.

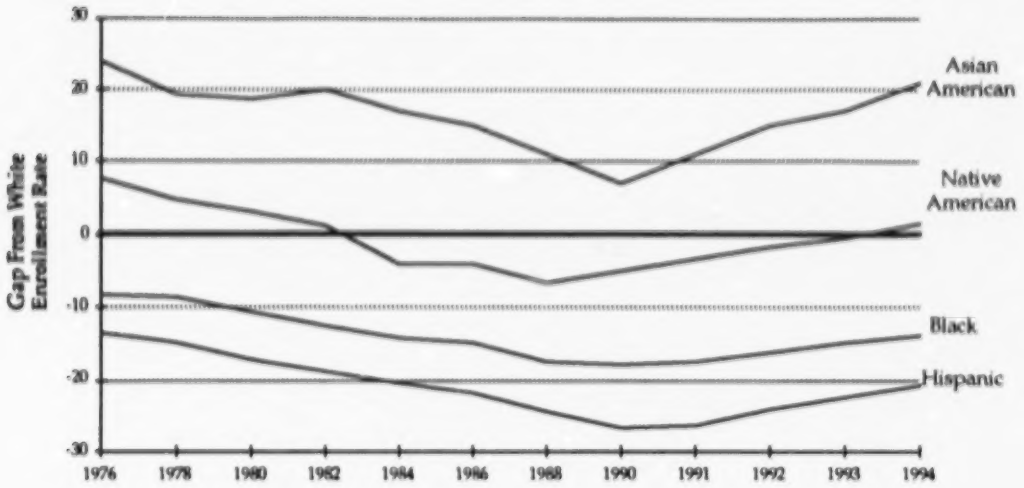
observers have noted that as public tuition prices have increased since the late 1980s, the gap between public and private tuition levels has been narrowed. Some students may find that a private institution is now a "better buy." Enrollment rates in private institutions, shown in Figure 8, follow similar patterns as in public institutions, with the major exception that Native American students enroll in private institutions at rates between those of Black and Hispanic students. While Black and Hispanic students have increased their enrollments in private institutions, their rates still lag behind that of Whites.



Source: Author's calculations from IPEDS data and Census Bureau.

Figure 8: U.S. Private College and University Enrollment Rates by Race

Figure 9 shows the gap between each race's total (public and private) enrollment rate, and that of Whites. As can be seen, the gap of both Black and Hispanic students widened during this period, to 14.1 points and 21.0 points respectively (as compared with 11.1 points and 14.5 points in public institutions alone). Thus, at least at the national level, it appears that there has been no wholesale shifting of Black and Hispanic students from public to private institutions, at least not relative to the behavior of White students.



Source: Author's calculations from IPEDS data and Census Bureau.

Figure 9: Difference Between Total (Public and Private) Minority Enrollment Rates and White Rate

Enrollment rates differ across the country due to a variety of factors. Perhaps the most critical differentiating factor is the regional influence. States in the northeast, for example, have a long history of private higher education. These states tend to have a high proportion of students enrolled in private postsecondary institutions. In the west, in contrast, higher education is dominated by the public institutions, who enroll the majority of undergraduates.

This regional effect can be seen in Figures 10 and 11, which shows the gap between White enrollment rates and those of Black and Hispanic students, respectively, in the nine census regions (note that the y-axis scale is in reverse order, to show the magnitude of the negative gaps — a higher value indicates a larger gap between the Black rate and the White rate).[20] Only in the Pacific region and New England did Blacks improve their position relative to Whites in 1994 compared with 1976. In the other seven regions the gap grew, and in some, quite substantially — from 2.1 points to 12.4 points in the East North Central region, and from 2.3 points to 12.3 points in the West North Central region. In those two regions, the near parity that Blacks enjoyed in their enrollment rates in 1976 was lost over the subsequent 18 years. One pattern that is fairly consistent across regions is the lowering of the gap in the 1990s, an interesting finding given the increase in public tuition prices during this period.

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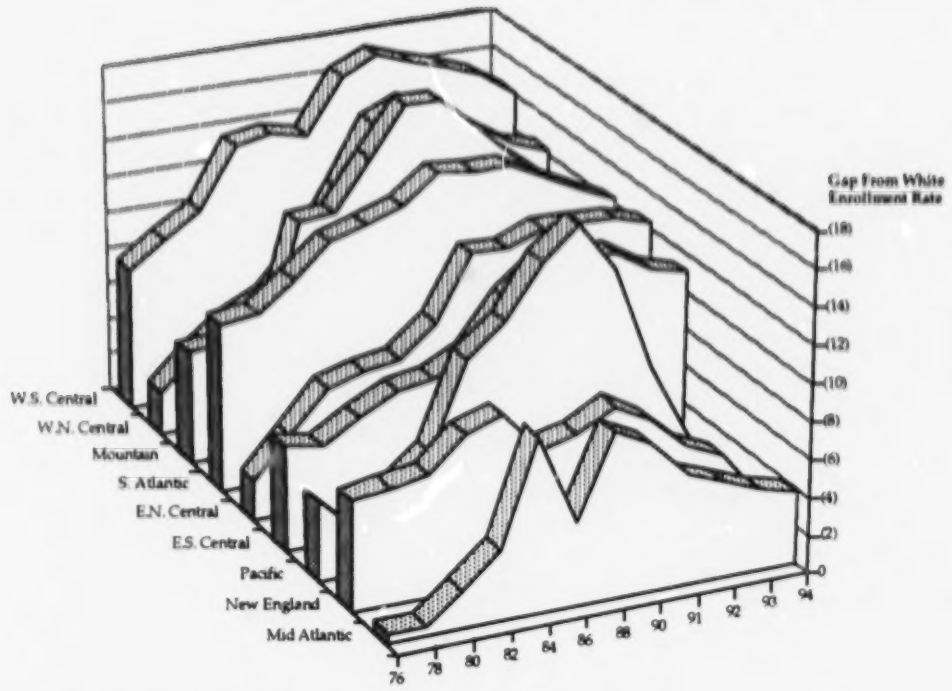
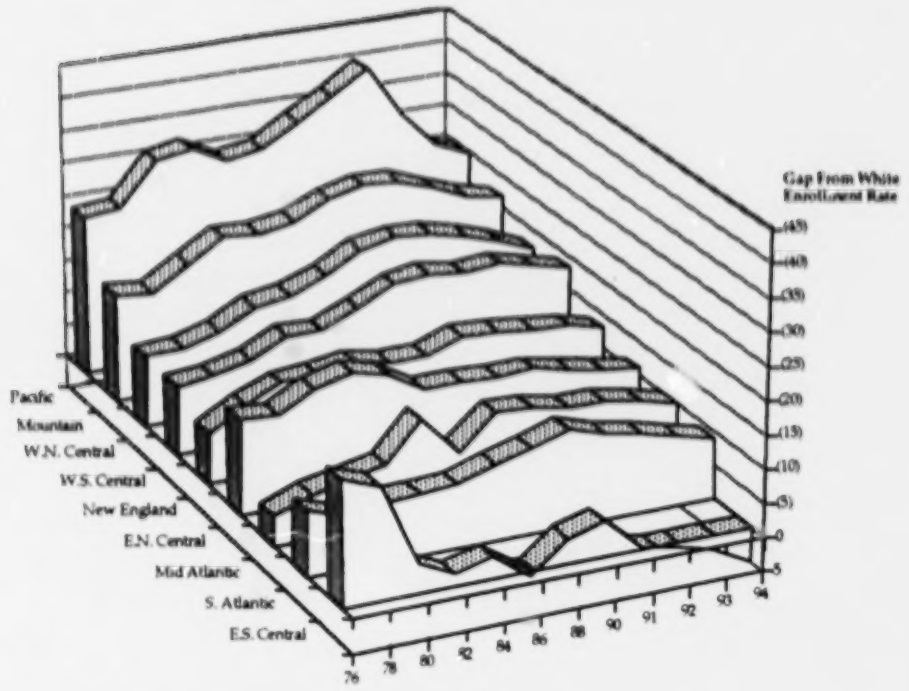
[20] A list of states in each region can be found in Appendix A.



Source: Author's calculations from IPEDS data and Census Bureau.

Figure 10: Difference Between Median Public Black Enrollment Rate and White Rate, by Region

For Hispanics, the patterns are similar. Only in the East South Central region (Alabama, Kentucky, Mississippi, and Tennessee) did Hispanics enroll at higher rates than Whites, and only for four of the 12 years. This area is characterized by a relatively small population of Hispanics in comparison with the rest of the country (less than 0.5% of the country's 18-24 year-old Hispanics lived in this region in 1994). The only other region in which Hispanics closed the gap was the East North Central region. While not as dramatic as the 1990s trend for Blacks, it does appear that Hispanics have been closing the gap in the last five years.



Source: Author's calculations from IPEDS data and Census Bureau.

Figure 11: Difference Between Median Public Hispanic Enrollment Rate and White Rate, by Region

5. Findings From Estimating the Fixed-Effects Models

The analysis on this section was conducted on a subset of the data. State unemployment rates were obtained from the U.S. Bureau of Labor Statistics (1996) for the period beginning in 1980, so the period of analysis is 1980 to 1994. Enrollments from the District of Columbia are not included, because the District does not have a public postsecondary system controlled by the "state" as the 50 states do.[21]

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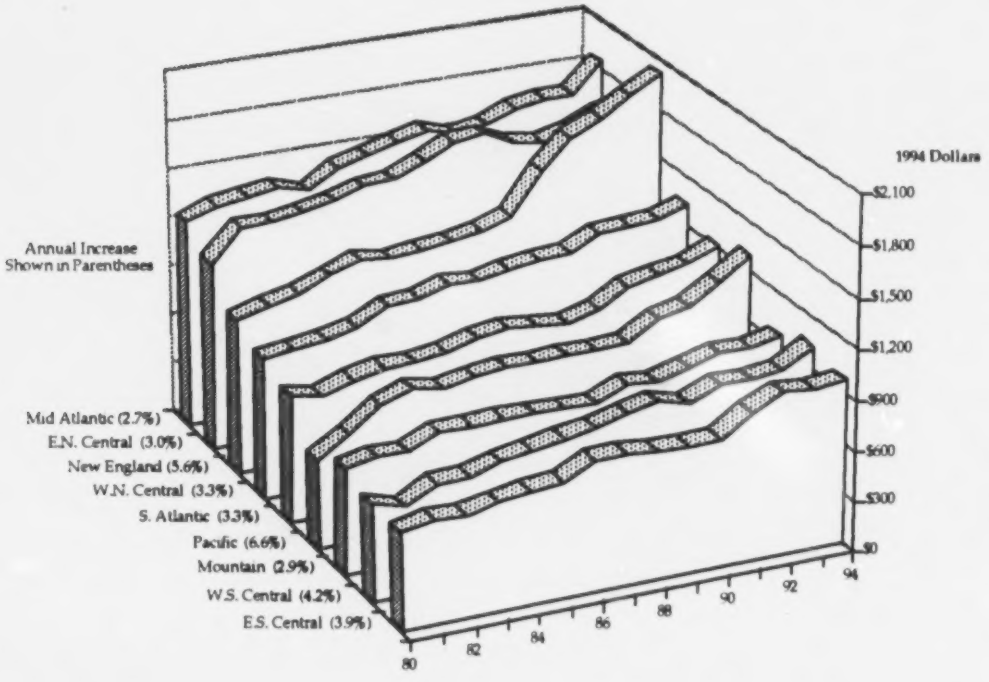
21 Other states excluded were South Dakota, which does not have a true community college sector, and South Carolina in 1980 and Hawaii in 1980 through 1984, for which reliable estimates of comprehensive tuition rates were not available through the Washington State Higher Education Coordinating Board.

Summary statistics on the data included in this study are presented in Table 2. Means and standard deviations are provided both unweighted, and weighted by the square root of the 18 to 24 population in the state in the 1990 Census.

Table 2: Descriptive Statistics of State-Level Data, 1980 to 1994

Variable and Measurement Unit	Unweighted Mean (SD)	Weighted Mean (SD)	Minimum	Maximum
OutcomeMeasures				
4-year Enrollment Rate All Races (percentage points)	19.79 (7.03)	16.23 (5.17)	8.80	49.79
4-year Enrollment Rate Blacks (percentage points)	14.63 (8.09)	11.38 (4.87)	1.73	54.01
4-year Enrollment Rate Hispanics (percentage points)	9.27 (5.17)	7.85 (4.00)	1.42	30.64
4-year Enrollment Rate Whites (percentage points)	21.14 (8.10)	17.60 (5.62)	8.58	57.68
Community College Enrollment Rate All Races (percentage points)	14.74 (8.79)	17.91 (9.32)	0.00	43.27
Community College Enrollment Rate Blacks (percentage points)	11.91 (8.56)	16.61 (10.32)	0.00	44.09
Community College Enrollment Rate Hispanics (percentage points)	9.22 (10.61)	11.37 (9.80)	0.00	83.69
Community College Enrollment Rate Whites (percentage points)	15.98 (9.99)	20.31 (11.71)	0.00	51.91
Question Variables				
Resident Community College Tuition (thousands of 1994 dollars)	1.08 (0.44)	9.94 (3.90)	0.00	2.46
Resident Comprehensive University Tuition (thousands of 1994 dollars)	1.85 (0.68)	17.19 (6.00)	0.39	3.89
State Need-Based Grants per 18-24 year old (hundreds of 1994 dollars)	0.49 (0.59)	0.70 (0.77)	0.01	3.80
Control Variables				
Annual Unemployment Rate, age 16+ All Races (percentage points)	6.67 (2.05)	6.96 (1.90)	2.20	15.50
Annual Unemployment Rate, age 16+ Blacks (percentage points)	13.64 (4.67)	13.86 (4.42)	1.94	33.30
Annual Unemployment Rate, age 16+ Hispanics (percentage points)	9.88 (3.96)	10.10 (3.52)	1.10	28.90
Annual Unemployment Rate, age 16+ Whites (percentage points)	5.82 (1.86)	6.00 (1.78)	2.10	14.70

It is the variation in these measures that creates the natural experiment that allows us to test the relationship between tuition, financial aid, and enrollment in public higher education. Figures 12 and 13 show the regional variations in community college and public comprehensive university tuition prices respectively in the nine census regions. Figure 12 demonstrates two distinct patterns. First, community colleges in the northeastern part of the country tend to be more expensive than in other regions. In 1994, the median community college tuition in New England was $2,010, as compared to under $1,000 in the East South Central and Mountain regions. Second, real tuition prices in every region of the country increased during this fifteen year period, from a low of 2.9% annually in the Mountain region to 6.6% annually in the far west. This increase in a region that historically had very low tuition rates helped to close the relative gap between tuition prices there and in the eastern part of the country.

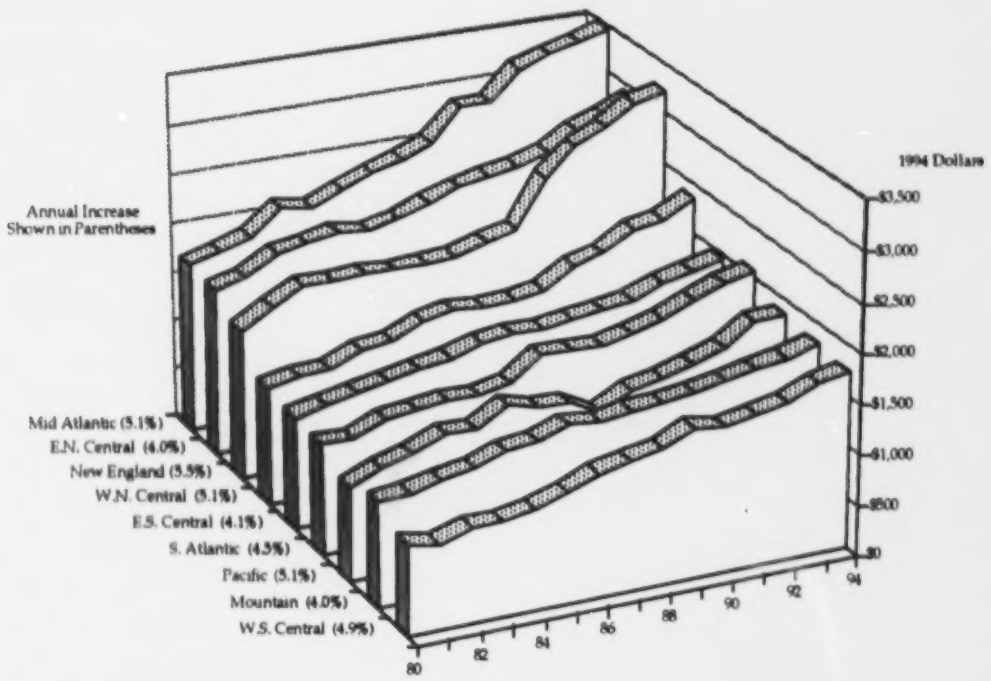


Source: Author's calculations from Washington State Higher Education Coordinating Board (1996)

Figure 12: Median Community College Tuition by Region in Constant Dollars

The pattern for comprehensive universities is similar. Tuition at states in the northeast tended to be more expensive than other regions in 1980. The relative gap actually

widened for these states, as they had annual rates of growth that were equal to or greater than the other parts of the country. Every region, however, saw increases that exceeded inflation by at least 4% annually.



Source: Author's calculations from Washington State Higher Education Coordinating Board (1996)

Figure 13: Median Public Comprehensive Tuition by Region in Constant Dollars

Figure 14 shows that state spending on need-based grants (as measured in constant dollars per 18-24 year old in the state) also varies by region. In general, those regions with higher tuition levels — such as the eastern part of the country — generally have higher levels of aid spending. In 1994 for example, Vermont, New York, and Pennsylvania each spent over $195 on need-based grants for every 18-24 year old in their states. These states, whether through explicit policy prescription or by chance, practice the high tuition/high aid strategy of funding public higher education.[22] The rate of growth of grant spending per capita varied across the country. Grant spending in the Mountain region actually decreased in real terms

22 See Hearn and Longanecker (1985), Hauptman (1992) and Wallace (1992) for analyses of this strategy.

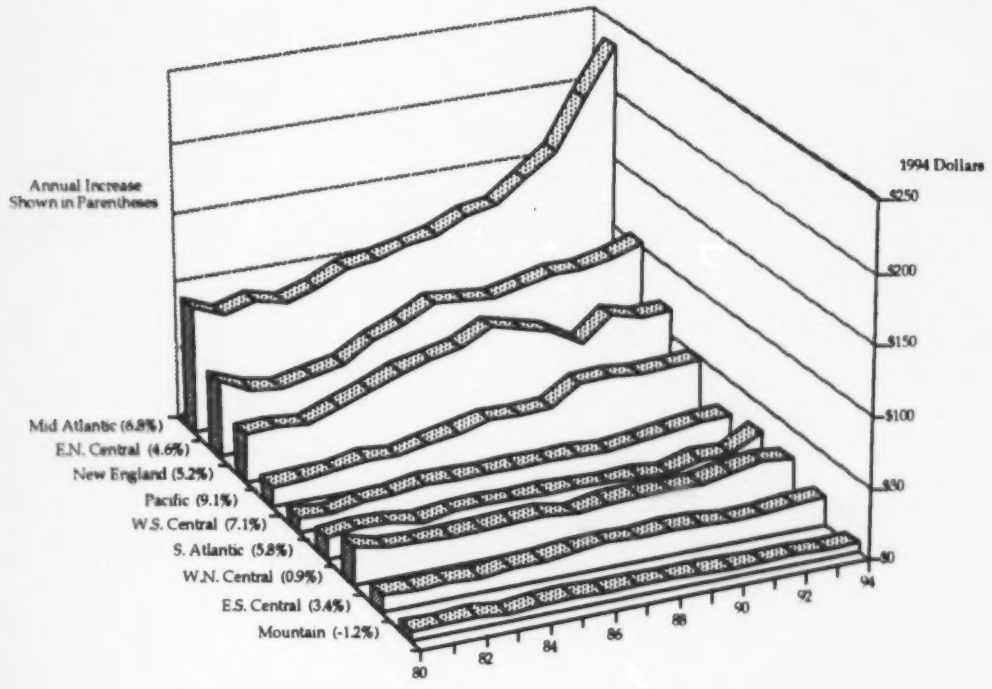


Figure 14: Median State Need-Based Grant Spending per 18 to 24 Year-Old by Region in Constant Dollars

during this period, and in the West North Central region it barely kept pace with inflation. The Pacific region, however, which had some of the largest percentage tuition increases, also had a large increase in grant spending (9.1% annually).

The trends outlined in the last two sections lead to the primary focus of this study: do increases in public college tuition (and/or changes in state grant spending) affect access to public higher education, and if so, to what extent? To answer this question, the fixed-effects model described in section 3 was estimated separately for community colleges and public 4-year institutions. Models were estimated for each of the three largest racial groups (Blacks, Hispanics, and Whites) and for all races combined.

Table 3 presents the results of estimating these models for 4-year institutions. For each racial group, three models are estimated. The first includes a change in community college tuition only (the cross-sector price), the second includes a comprehensive university change alone, and the third includes changes in both sectors simultaneously.[23] All models include state

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[23] Models were estimated that included the flagship university tuition price in each state. It was found that this price was generally not significant, especially when the comprehensive university tuition is

grant expenditures and unemployment rates (of those 16 years old or older) for the appropriate racial group.

Table 3: Coefficients (Standard Errors) of Fixed-Effects Models for 4-Year Institutions

Outcome variable is the undergraduate enrollment rate in public 4-year institutions

Model	Comm. College Tuition (1994 $000s)	Comp. University Tuition (1994 $000s)	16+ Unemp. Rate† (Percentage Points)	State Grants per 18-24 Population (1994 $00s)	N
All Races – 1	0.555 (0.563)		-0.325** (0.069)	-0.236 (0.365)	489
All Races – 2		-1.029** (0.311)	-0.281** (0.071)	-0.206 (0.364)	497
All Races – 3	2.021** (0.642)	-1.571** (0.357)	-0.257** (0.070)	-0.180 (0.357)	486
Blacks – 1	-0.188 (0.815)		-0.042 (0.033)	0.683 (0.527)	489
Blacks – 2		-0.833~ (0.468)	-0.037 (0.035)	0.526 (0.553)	497
Blacks – 3	0.716 (0.945)	-0.974~ (0.520)	-0.034 (0.033)	0.725 (0.529)	486
Hispanics – 1	0.676 (0.738)		-0.087* (0.039)	-0.512 (0.477)	489
Hispanics – 2		-1.334** (0.392)	-0.096* (0.038)	-0.370 (0.465)	497
Hispanics – 3	2.650** (0.829)	-2.095** (0.451)	-0.084* (0.038)	-0.432 (0.464)	486
Whites – 1	0.136 (0.574)		-0.344** (0.078)	-0.554 (0.372)	489
Whites – 2		-1.262** (0.314)	-0.305** (0.079)	-0.537 (0.370)	497
Whites – 3	1.765** (0.653)	-1.722** (0.360)	-0.276** (0.078)	-0.487 (0.362)	486

† The unemployment rate used in each model is the rate for that group.

~p≤.10 *p≤.05 **p≤.01

Note: All models include state fixed effects and division by year interactions.

included. This is likely because of the high correlation between the two, and thus, the flagship tuition was not included in the final models. This is consistent with the methodology used by Rouse (1994).

The coefficients on the two tuition prices generally demonstrate the effects one would expect to find. For most groups, an increase in the cross-sector price is related to an *increase* in enrollments at 4-year institutions. As community colleges get more expensive, students may find that 4-year institutions are a better buy and shift into that sector.[24] Conversely, an increase in comprehensive tuition levels is related to a *decrease* in enrollment at all 4-year institutions, in accordance with student demand theory discussed in section 2. The results for the individual racial groups show that Hispanic students in the 4-year sector are the most sensitive to tuition increases, followed by White students and Blacks. In none of the models do changes in per capita state grant expenditures have effects that are significantly different from zero, indicating that increasing state grant awards does little to increase aggregate enrollment in this sector.

Since attending college can be a substitute for entering the workforce, many researchers have hypothesized that unemployment may be positively associated with college enrollment, i.e., as employment possibilities lessen, individuals may be more likely to enter college as their opportunity costs decrease.[25] A countervailing force, however, is that a worsening economy may mean that students and families have fewer resources available to fund a college education. The models shown above indicate that an increase in unemployment is generally related to a *decrease* in enrollments at 4-year institutions. These results may indicate that worsening economic conditions make it harder for students and their families to afford these colleges and universities, even though the opportunity costs of attending college are lower. Another explanation is that worsening economic conditions may be causing students to shift from 4-year institutions to community colleges. The enrollments of White students are most sensitive to changes in their unemployment rates.

The magnitude of these effects can be seen by examining individual models. For example, the model for all races that includes changes in both tuition measures (model 3) indicates that a $1,000 increase in comprehensive university tuition rates (in 1994 dollars) is related to a drop in the enrollment rate at 4-year institutions of 1.57 percentage points, *ceteris paribus*. Similarly, a $1,000 increase in community college tuition would increase enrollment rates in the 4-year sector by 2.02 percentage points. These two increases, when taken together, would lead to an increase at 4-year institutions of almost 1/2 percentage point (2.021 + -1.571 = 0.45). A one percentage point increase in unemployment in a state is related to a drop in

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24 See Gose (1995) for one interesting examination of this hypothesis.

25 See for example Ahlburg, McPherson, and Schapiro (1994), Blakemore and Low (1983), Corazzini, Dugan, and Grabowski (1972) and Jackson (1988).

enrollments of approximately a quarter percentage point. Table 4 shows the impact of a one standard deviation change in the key question and control variables on enrollment rates in 4-year institutions.

Table 4: Effect of One Standard Deviation Change in Question Variables on Enrollment Rates in Public 4-Year Institutions

			16+ Unemployment Rates		
Model	Comm. College Tuition ($540)	Comp. Univ. Tuition ($750)	All Races (1.9 points)	Hispanics (3.5 points)	Whites (1.8 points)
All Races – 3	1.09 points	–1.18 points	–0.49 points		
Blacks – 3	NS	-0.73 points			
Hispanics – 3	1.43 points	–1.57 points		–0.29 points	
Whites – 3	0.95 points	–1.29 points			–0.50 points

NS: Not significant

Note: Standard deviations are weighted by the 18-24 population in each state.

Turning now to community colleges, Table 5 presents the results of estimating the same models for that sector. The tuition effects in this sector are different from those in 4-year institutions. For all races combined, increases in community college tuition prices are related to *decreases* in enrollment in community colleges. The effect size is approximately twice that of the corresponding own-sector tuition increase for 4-year institutions, i.e., community college enrollments are more sensitive to their own-sector tuition increases than are enrollments in 4-year institutions. When examining individual racial groups, this effect holds only for Hispanics and marginally for Whites. The change in enrollment for Black students is not significantly different from zero.

Table 5: Coefficients (Standard Errors) of Fixed-Effects Models for Community Colleges

Outcome variable is the undergraduate enrollment rate in public community colleges

Model	Comm. College Tuition (1994 $000s)	Comp. University Tuition (1994 $000s)	Unemp. Rate (Percentage Points)	State Grants per 18-24 Population (1994 $00s)	N
All Races – 1	-3.185**		0.277**	1.100*	489
	(0.771)		(0.095)	(0.50)	
All Races – 2		-1.196**	0.336**	1.176*	497
		(0.429)	(0.097)	(0.502)	
All Races – 3	-2.833**	-0.430	0.303**	1.163*	486
	(0.895)	(0.498)	(0.097)	(0.499)	
Blacks – 1	-0.152		0.046	3.875**	489
	(1.271)		(0.052)	(0.823)	
Blacks – 2		-1.395*	0.062	4.135**	497
		(0.681)	(0.051)	(0.804)	
Blacks – 3	1.454	-1.811*	0.065	4.015**	486
	(1.462)	(0.804)	(0.052)	(0.818)	
Hispanics – 1	-1.988		0.085	2.943**	489
	(1.268)		(0.067)	(0.819)	
Hispanics – 2		0.784	0.091	2.732**	497
		(0.683)	(0.066)	(0.811)	
Hispanics – 3	-3.502*	1.675*	0.082	2.817**	486
	(1.465)	(0.798)	(0.067)	(0.820)	
Whites – 1	-2.743**		0.243~	0.877	489
	(0.954)		(0.130)	(0.617)	
Whites – 2		-1.638**	0.352**	1.061~	497
		(0.511)	(0.128)	(0.602)	
Whites – 3	-1.673	-1.277*	0.324*	1.010~	486
	(1.094)	(0.602)	(0.130)	(0.607)	

† The unemployment rate used in each model is the rate for that group.

~p≤.10 *p≤.05 **p≤.01

Note: All models include state fixed effects and division by year interactions.

In comparison with the 4-year sector, increases in the cross-sector price alone in general are related to a *decrease* in enrollments in community colleges. The same sector shifting effect seen in 4-year institutions does not appear to be present when examining community college

enrollments. For example, an increase of $1,000 in comprehensive university tuition prices alone leads to a decrease in the enrollment rate of all students in community colleges of 1.2 percentage points. One possible explanation for this finding is that students who are likely to attend a community college may be reacting to publicity about prices at 4-year institutions. Most of the news stories about college costs focus on prices at baccalaureate institutions and rarely discuss tuition levels at community colleges.[26] They thus may be overestimating the cost of attending community colleges based on the information they hear about more expensive institutions. This finding was confirmed by a recent survey conducted by the American Council on Education ("Public Overestimates College Costs", 1996), which asked respondents to estimate the cost of tuition in four sectors: community colleges, public universities, private liberal arts colleges, and private universities. The survey found that people overestimated the price of community colleges by the largest margin (427%). Another explanation is that community college students may plan on transferring at some point in the future to public 4-year institutions. Thus, higher prices in that sector may discourage them from enrolling in college at all.

When tuition prices are increased in both sectors, the community college tuition dominates the impact of the cross-sector increase. The two together lead to a drop in the enrollment rate in community colleges of 3.26 points (-2.833 + -0.430 = -3.263). The only group for whom increases in the cross-sector price lead to increases in community college enrollments is Hispanic students. When prices are raised in both sectors, the overall effect on the enrollment rate of Hispanic students in community colleges is still a decrease of 1.83 points (-3.502 + 1.675 = -1.827).

The enrollment rates of all students together and each of the three racial groups are sensitive to changes in state grant spending. Increases in state grants lead to increases in enrollment in community colleges, with the effect largest for Black and Hispanic students. For example, an increase in per capita state grant spending is associated with an increase of: 1.16 percentage points in the enrollment rate of all students; 4.02 points for Blacks; 2.82 points for Hispanics, and 1.01 points for White students. A reason for this greater sensitivity for Blacks and Hispanics may be because they are more likely to be eligible for these grants, since on average, these groups have lower family income levels than Whites.[27] Another reason why enrollments in community colleges are sensitive to state grant expenditures is because lower income students (those most eligible for need-based grants) are disproportionately enrolled in community colleges.

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26 See for example Morganthau and Nayyar (1996) and "Tuition Increases Far Outpace Inflation" (1996).

27 In 1994, median income was $42,549 for White families, $24,698 for Black families, and $24,318 for Hispanic families nationally (U.S. Bureau of the Census, 1996g).

For all races combined and for White enrollments, increases in unemployment lead to increases in enrollments in community colleges, a finding consistent with the classical literature on the relationship between unemployment and college entry (see note 25 on page 25). The enrollment of Black and Hispanic students appear to be insensitive to economic conditions, indicating that any enrollment "push" received by these students from the lowering of opportunity costs may be offset by a lesser availability of funds to pay for college.

Table 6 shows the effect of a one standard deviation change in the key question and control variables on enrollment rates in community colleges.

Table 6: Effect of One Standard Deviation Change in Question Variables on Enrollment Rates in Community Colleges

			16+ Unemployment Rates		
Model	Comm. College Tuition ($540)	Comp. Univ. Tuition ($750)	All Races (1.9 points)	Whites (1.8 points)	Per Capita Grants ($77)
All Races – 3	-1.53 points	NS	0.58 points		0.90 points
Blacks – 3	NS	-1.36 points			3.09 points
Hispanics – 3	-1.89 points	1.26 points			2.17 points
Whites – 3	NS	-0.96 points		0.58 points	0.78 points

NS: Not significant

Note: Standard deviations are weighted by the 18-24 population in each state.

Another way of analyzing this relationship is by looking at the actual increases in tuition and grant-spending in one year. In 1994, the median community college tuition increase was $60, and the median comprehensive university increase was $140. Given the results of the models fitted here, one would expect a resultant drop in the enrollment rate of all students in community colleges of 0.230 points if these two increases were implemented.[28] The median increase in grant spending per 18 to 24 year-old in the same year was $13.54, or enough to help increase enrollments by only .157 points. Thus, the median grant spending increase offset 68% of the enrollment drop due to increased tuition prices.

[28] (-2.833 X 0.06) + (-0.430 X 0.14) = -0.230

6. Conclusions and Opportunities for Further Research

The findings of this study are consistent with those of many previous student demand studies. While Leslie and Brinkman (1988) estimated a student price response coefficient (SPRC) of approximately -0.70 for a $100 tuition increase, the equivalent SPRC here for community colleges is -0.32 and for 4-year institutions is -.10.[29] One would expect a lower measure here, however, as this study analyzed the enrollment response of *all* students, not just first-time enrollees. All other things being equal, first-time enrollees should be more price sensitive, as they have not yet made an investment in a postsecondary education. Already-enrolled students should be more willing to pay higher tuition levels in order to complete a degree program and gain the benefits in the labor markets (and elsewhere) of obtaining a college diploma.

This study found that students, at least in community colleges, are sensitive to changes in state need-based grant spending. In addition, it is apparent that the effect of changing economic conditions on enrollment rates depends upon which sector is examined. While enrollments in 4-year institutions appear to be inversely related to unemployment (as unemployment increases, enrollment rates decrease), enrollments in community colleges are positively related to changes in unemployment rates.

As described in section 2, few recent studies have examined the tuition and grant sensitivity of community college students as compared to those in baccalaureate institutions. This study has helped to expand the literature on student demand studies by examining the potential impact of state policies regarding tuition prices and need-based grant spending on students in both of these sectors. It is clear, however, that price alone does not determine whether or not students go to college. If this were the case, enrollments should have dropped in the last decade as real public tuition levels rose at rates that far exceeded the ability of students and families to pay for college.

One benefit of the methodology used in this study is that it provides a benchmark "performance level" for states, given a number of characteristics: specific state attributes, such as the history of private higher education and region of the country (the so-called "state effects"); tuition levels; grant spending; and economic conditions. The models allow you to estimate for each state what its predicted enrollment rate should be for each racial group in each sector, given these characteristics.

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[29] These are the SPRCs using the tuition coefficients for the models with a change in the same-sector price only. The coefficients have to be divided by 10 to convert to a Leslie and Brinkman SPRC, as the tuition levels in these models are measured in thousands of dollars.

Figure 15 shows a plot of the residuals from the Black model of enrollment rates in 4-year institutions against those of the White model in the same sector.[30] States are shown only if they are above the median 18 to 24 population in the 1990 Census, and only if the residuals from one or both models was greater than 1.25 percentage points or less than -1.25 percentage points of enrollment. The state and year are indicated for the largest outliers.

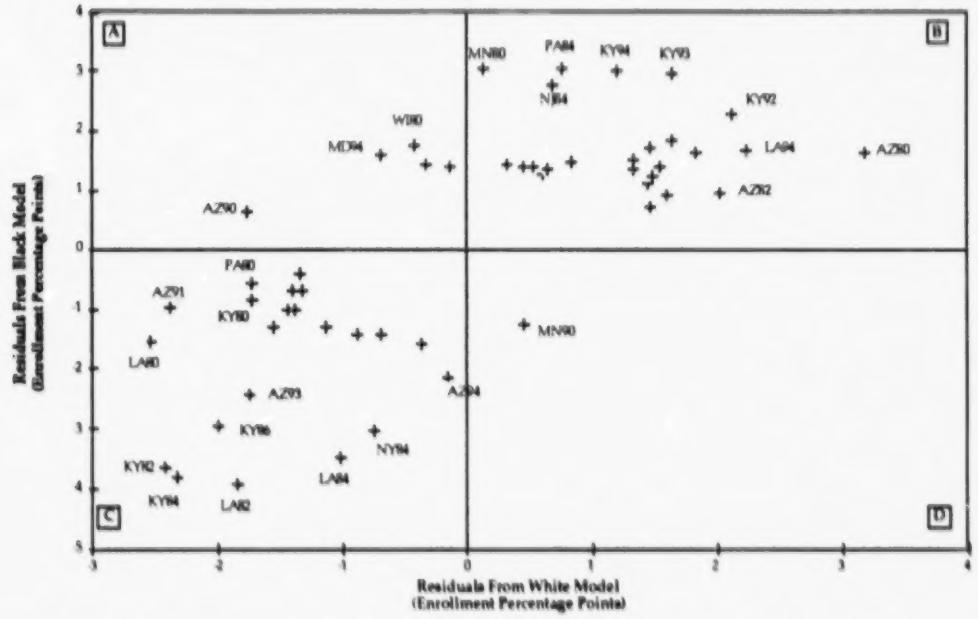

Figure 15: Comparison of Residuals From Black and White Models of 4-Year Enrollment Rates

Figure 15 allows you to compare the performance level of states given their characteristics outlined above. For example, states in quadrant A (such as Arizona in 1990) had higher enrollment rates for Black students than that predicted by the model, but lower rates for White students. Conversely, those in quadrant D had higher rates for White students but lower than the predictions for Black students. States in quadrant B outperformed the model for both groups, and states in quadrant C had lower enrollment rates for both groups. For example, enrollment rates of both White students and Black students in Kentucky in 1980, 1982, and 1984 (quadrant C) were lower than what would have expected given the tuition levels, state grant spending, and unemployment rate in Kentucky in those years.

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30 The models used are the third for each group, that included tuition levels in both sectors.

This analysis allows you to identify states (and years) where enrollment rates for one or both groups were unusually high or low. While the reasons for these divergences are beyond the scope of this study, this methodology can be a valuable tool for policy analysts and researchers interested in those factors besides price and economic conditions that affect access to public higher education.

Additional opportunities for research that could be conducted using this state-level methodology include:

- Full-time versus part-time enrollments — are more students being forced to attend college part-time due to rising prices (and/or changing economic conditions)?
- First-time freshman versus total enrollments — are first-time enrollees more price sensitive?
- Testing the effect of using different age cohorts (other than 18-24) in the denominator of the enrollment rate calculation
- Testing the assumption of perfectly elastic supply — how much do public colleges and universities adjust their enrollments to meet market demand?

Appendix A
List of Census Bureau Regions

Region Name	States
New England	CT, MA, ME, NH, RI, VT
Middle Atlantic	NY, NJ, PA
East North Central	IL, IN, MI, OH, WI
West North Central	IA, KS, MN, MO, ND, NE, SD
South Atlantic	DC, DE, FL, GA, MD, NC, SC, VA, WV
East South Central	AL, KY, MS, TN
West South Central	AR, LA, OK, TX
Mountain	AZ, CO, ID, MT, NM, NV, UT, WY
Pacific	AK, CA, HI, OR, WA

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